Statement of

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Before the

House of Representatives
Committee on Government Reform
Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census

"The Science of Voting Machine Technology: Accuracy, Reliability, and Security"

July 20, 2004

Chairman Putnam, Ranking Member Clay, and members of the Subcommittee thank you for the opportunity to testify today on "The Science of Voting Machine Technology: Accuracy, Reliability and Security." Major changes are taking place in the way we conduct elections. Our trusty old ballot boxes often are being replaced by a host of new technologies. Citizens are now much more likely to encounter optical scanners or touch screen systems at the polling place than a wooden box with a sturdy lock. As a result of these changes, Congress enacted the Help America Vote Act, commonly known as HAVA, and mandated specific research and development roles for the National Institute of Standards and Technology (NIST).

Many of the issues we are examining today are all directly related to standards and guidelines. As we like to say at NIST, if you have a good standard, you can have a good specification, and with proper testing you will be assured that the equipment performs as required. Congress understood the importance of standards in voting technologies and specifically gave the Director of NIST the responsibility of chairing the Technical Guidelines Development Committee (TGDC), a committee reporting to the EAC under HAVA. This committee is charged with making recommendations to the Election Assistance Commission (EAC) with regard to voluntary standards and guidelines for election-related technologies that have an impact on many of the issues we are discussing.

While we have considerable experience in "standards development", NIST understands that as a non-regulatory agency our role is limited and has started to meet with members of the "elections community", – ranging from disability advocacy groups, voting advocacy groups, researchers, state and local election officials, and vendors – to learn about their concerns. Ultimately, in coordination with the EAC and the broader "elections community" we want to apply our "standards development" experience to election-related technologies so that, when voting is complete, the vote tally will be accurate and done in a timely manner.

NIST is by no means a newcomer to the issues related to electronic voting. Previous to the HAVA, NIST's involvement in studying voting machine technology resulted in the publication of two technical papers in 1975 and 1988. NIST's recent activities related to voting system technology have been preparatory to the implementation of HAVA and fulfilling the initial mandates of the law.

At the request of Congress and the National Association of State Election Directors, NIST organized and hosted a *Symposium on Building Trust and Confidence in Voting Systems* in December of 2003 at its Gaithersburg headquarters. Over three hundred attendees from the election community attended the seminar to begin discussion, collaboration and consensus on voting reform issues. Symposium participants included state and local election officials; vendors of voting equipment and systems, academic researchers; representatives of the cyber-security and privacy community; representatives from the disability community, standards organizations and independent testing authorities, as well as newly appointed U.S. Election Assistance Commissioners. Representative stakeholders participated with NIST scientists in panels addressing:

- Testability, Accreditation and Qualification in Voting Systems;

- Security and Openness in Voting Systems; and
- Usability and Accessibility in Voting Systems.

Attendees agreed that they all shared the goals of:

- Practical, secure elections, with every vote being important;
- The importance of looking at the voting system end-to-end;
- The need for good procedures & best practices in physical & cyber security;
- The need to improve current testing & certification procedures;
- The need to separately address both short-term and long-term challenges; and
- The benefits of the election community working as a team.

As required under HAVA, earlier this year NIST recently delivered to the EAC a report "which assesses the areas of human factors research and human-machine interaction, which feasibly could be applied to voting products and systems design to ensure the usability of and accuracy of voting products and systems, including methods to improve access for individuals with disabilities (including blindness) and individuals with limited proficiency in the English Language and to reduce voter error and the number of spoiled ballots in elections". The EAC delivered the report to Congress on April 30, 2004.

The report titled "Improving the Usability and Accessibility of Voting Systems and Products," assesses human factors issues related to the process of a voter casting a ballot as he or she intends. The report's most important recommendation is for the development of a set of usability standards for voting systems that are performance-based. Performance-based standards address results rather than equipment design. Such standards would leave voting machine vendors free to develop a variety of innovative products if their systems work well from a usability and accessibility standpoint. Additionally, the report emphasizes developing the standards in a way that would allow independent testing laboratories to test systems to see if they conform to the usability standards. The labs would employ objective tests to decide if a particular product met the standards.

In total the report makes 10 recommendations to help make voting systems and products simpler to use, more accurate and easily available to all individuals – including those with disabilities, language issues and other impediments to participating in an election. The recommendations highlight the need to:

1) Develop voting system standards for usability that are performance-based, relatively independent of the voting technology, and specific (i.e., precise).

2) Specify the complete set of user-related functional requirements for voting products in the voting system standards.

3) Avoid low-level design specifications and very general specifications for usability.

4) Build a foundation of applied research for voting systems and products to support the development of usability and accessibility standards.

5) To address the removal of barriers to accessibility, the requirements developed by the Access Board, the current VSS (Voting System Standards), and the draft IEEE (Institute of Electrical and Electronics Engineers) standards should be reviewed, tested, and tailored to voting systems and then considered for adoption as updated VSS standards. The feasibility of addressing both self-contained, closed products and open architecture products should also be considered.

6) Develop ballot design guidelines based on the most recent research and experience of the visual design communities, specifically for use by election officials and in ballot design software.

7) Develop a set of guidelines for facility and equipment layout; develop a set of design and usability testing guidelines for vendor- and state-supplied documentation and training materials.

8) Encourage vendors to incorporate a user-centered design approach into their product design and development cycles including formative (diagnostic) usability testing as part of product development.

9) Develop a uniform set of procedures for testing the conformance of voting products against the applicable accessibility requirements.

10) Develop a valid, reliable, repeatable, and reproducible process for usability conformance testing of voting products against the standards described in recommendation 1) with agreed upon usability pass/fail requirements.

NIST views as a top priority accomplishing its impending responsibilities mandated in the HAVA in partnership with the EAC. These mandates include the recommendation of voluntary voting system standards to the EAC through its Technical Guidelines Development Committee. The first set of voluntary standards is due nine months after the appointment of the fourteen members by the EAC.

The TGDC held its first meeting on July 9, 2004. Fourteen of the fifteen appointed members of the Technical Guidelines Development Committee participated in the first plenary meeting. Dr. Arden Bement NIST's Director serving as chairman, set as a goal for the meeting to agree on a procedural road map for standards development as well as a preliminary work plan.

Specifically, the chair recommended the committee strive for five distinct deliverables to the EAC in the next nine months:

1) A list of publicly vetted requirements for voluntary voting system standards;
2) Recommendations for standards that currently exist with changes if necessary;

3) An assessment of best practices that can be made available to the election community for use in the 2006 election cycle;
4) A recognition and statement thereof of those areas where there are no current standards under development; and
5) A prioritized calendar for future standards development relative to each of the four previous deliverables.

In addition the TGDC adopted a resolution that established three working subcommittees to address security and transparency, human factors and privacy, and core requirements and testing. Dr. Bement and the members of the TGDC believe that his goal for the initial plenary session was indeed met. Our current plans call for the next plenary session on or about January 2005 with public meetings between now and then to gather data, and subcommittee meetings to analyze the data and form initial resolutions.

Another important role for NIST under HAVA is to develop a formal accreditation program to laboratories that test voting system hardware and software for conformance to the current Voting System Standards. On June 23, 2004, NIST announced in the Federal Register the establishment of a Laboratory Accreditation Program for Voting Systems. NIST will carry out the accreditation of these laboratories through the National Voluntary Laboratory Accreditation Program (NVLAP), which is administered by NIST. NVLAP is a long-established laboratory accreditation program that is recognized both nationally and internationally. NVLAP accreditation criteria are codified in the Code of Federal Regulations (CFR, Title 15, Part 285).

NVLAP will conduct a public workshop on August 17th to review its accreditation criteria, as well as receive comments and feedback from the participating laboratories and other interested parties. After the workshop, NVLAP will finalize specific technical criteria for testing laboratories and make the necessary logistical arrangements to begin the actual assessment of the laboratories. NVLAP must identify, contract, and train technical expert assessors; laboratories must complete the NVLAP application process; rigorous onsite assessments must be conducted; and laboratories undergoing assessment must resolve any identified nonconformities before accreditation can be granted. It is our intention that laboratories will be able to formally apply to NVLAP and initiate the assessment process in early 2005 if not sooner.

Simply stated, laboratory accreditation is formal recognition that a laboratory is competent to carry out specific tests. Expert technical assessors conduct a thorough evaluation of all aspects of laboratory operation that affect the production of test data, using recognized criteria and procedures. General criteria are based on the international standard ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, which is used for evaluating laboratories throughout the world. Laboratory accreditation bodies use this standard specifically to assess factors relevant to a laboratory's ability to produce precise, accurate test data, including the technical competency of staff, validity and appropriateness of test methods, testing and quality assurance of test and calibration data. Laboratory accreditation programs usually also specify field-specific technical criteria that laboratories must meet, in addition to demonstrating general technical competence.

Laboratory accreditation thus provides a means of evaluating the competence of laboratories to perform specific types of testing, measurement and calibration. It also allows a laboratory to determine whether it is performing its work correctly and to appropriate standards.

Laboratories seeking accreditation to test voting system hardware and software will be required to meet the NVLAP criteria for accreditation which include: ISO/IEC 17025, the 2002 Voting System Standards, and any other criteria deemed necessary by the Election Assistance Commission (EAC). To ensure continued compliance, all NVLAP-accredited laboratories undergo an onsite assessment before initial accreditation, during the first renewal year, and every two years thereafter to evaluate their ongoing compliance with specific accreditation criteria.

Only after a laboratory has met all NVLAP criteria for accreditation will it be presented to the Election Assistance Commission for its approval to test voting systems. The EAC may impose requirements on the laboratories in addition to NVLAP accreditation.

Finally, NIST has compiled best security practices relevant to election security from current Federal Information Processing standards (FIPS). These standards are available on the NIST website (http://vote.nist.gov/securityrisk.pdf) and will be available on EAC's website (http://www.fec.gov/pages/vssfinal/vss.html). This compilation is intended to help state and local election officials with their efforts to better secure voting equipment before the November 2004 election.

NIST realizes how important it is for voters to have trust and confidence in voting systems even as new technologies are introduced. Increasingly, computer technology touches all aspects of the voting process – voter registration, vote recording, and vote tallying. NIST believes that rigorous standards, guidelines, and testing procedures will enable U.S. industry to produce products that are high quality, reliable, interoperable, and secure thus enabling the trust and confidence that citizens require and at the same time preserving room for innovation and change.

Thank you for the opportunity to testify. I would be happy to answer any questions the Committee might have.

Hratch Semerjian, Acting Director

Hratch G. Semerjian is serving as Acting Director of NIST while Arden Bement serves in a temporary capacity as the Acting Director of the National Science Foundation. Dr. Semerjian has served as the Deputy Director of NIST since July 2003. In this position, Dr. Semerjian is responsible for overall operation of the Institute, effectiveness of NIST's technical programs, and for interactions with international organizations. NIST has a total budget of about $771 million, and a permanent staff of about 3,000, as well as about 1,600 guest researchers from industry, academia, and other national metrology institutes from more than 40 countries. Most of the NIST researchers are located in two major campuses in Gaithersburg, Md., and Boulder, Colo. NIST also has two joint research institutes; the oldest of these is JILA, a collaborative research program with the University of Colorado at Boulder, and the other is CARB (Center for Advanced Research in Biotechnology), a partnership with the University of Maryland Biotechnology Institute.

Dr. Semerjian received his M.Sc. (1968) and Ph.D. (1972) degrees in engineering from Brown University. He served as a lecturer and post doctoral research fellow in the Chemistry Department at the University of Toronto. He then joined the research staff of Pratt & Whitney Aircraft Division of United Technologies Corp. in East Hartford, Conn. In 1977, Dr. Semerjian joined the National Bureau of Standards (now NIST), where he served as Director of the Chemical Science and Technology Laboratory (CSTL) from April 1992 through July 2003. Awards he has received include the Fulbright Fellowship, C.B. Keen Fellowship at Brown, the U.S. Department of Commerce Meritorious Federal Service (Silver Medal) Award in 1984, and the U.S. Department of Commerce Distinguished Achievement in Federal Service (Gold Medal) Award in 1995. In 1996, he was elected a Fellow of the American Society of Mechanical Engineers. In 1997, he received the Brown Engineering Alumni Medal. Dr. Semerjian was elected to the National Academy of Engineering in 2000.